

U.S. Patent Application Serial No. 10/825,202
Response filed October 18, 2007
Reply to OA dated August 2, 2007

REMARKS

Claims 1, 3-10 and 13-16 are pending in this application. No amendment is made in this Response. It is believed that this Amendment is fully responsive to the Office Action dated **August 2, 2007**.

Claims 1, 3, 5, 9, and 13-16 are rejected under 35 U.S.C. §102(b) as being anticipated by or, in the alternative, under 35 U.S.C. §103(a) as obvious over JP 63028639 A. (Office action page 2)

The rejection of claims 1, 3, 5, 9 and 13-16 over JP '639A is respectfully traversed, and reconsideration of the rejection is requested. In traversing the rejection, Applicant maintains the arguments made in the Amendment dated July 2, 2007, and here responds to the Examiner's response to those arguments.

In the last Amendment, Applicant had argued, in particular, that JP '639A does not disclose that the clay is water swelling, and does not disclose that the composite is crosslinked by interaction between the polymer and clay to form a three-dimensional network structure.

The Examiner responds on page 2 of the present Office action with reference to page 8, lines 3-11, of the present specification. However, Applicant submits that this argument, which is based on the present specification but which does not specifically address the teachings of JP '639A, is unclear. Similarly, the Examiner refers to page 10, lines 7-10, of the specification, regarding the

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term “interact” in claim 1, but again Applicant respectfully submits that the Examiner’s point is not clear, since the issue at hand is the presence of the “three dimensional network structure.”

In addition, the Examiner refers to Applicant’s previous argument that: “the reference discloses that it is the crosslinker that links the polymers to form the composite.” The Examiner states that “use of the organic crosslinker is taught in lines 4-6 of page 10 contrary to applicant’s assertion.” However, Applicant submits that the fact that there can be an optional crosslinker (C) (see page 8, lines 14-15) in the present invention is irrelevant to Applicant’s argument that, in JP '639, the crosslinker links the polymers to form the composite.

With regard to claims 13-16, the Examiner notes that these product-by-process claims are products, not processes. However, Applicant had not argued that they were processes. Since these claims depend ultimately from claim 1, the arguments regarding claim 1 are applicable to claims 13-16.

The Examiner also states on page 3 of the Office action that claim 1 does not recite the amount of polymer and clay, and the claims “do not require swelling of clay.” The Examiner again states that “the clay is inherently water swelling ...” and that the “water-absorbing property of said (layered) clay [is] well known in the art.”

The statement by the Examiner apparently counters Applicant’s argument that “JP '639A neither teaches nor suggests that the clay is water-swelling.” In response, Applicant first notes that claim 1 clearly does require “a water swelling clay mineral (B).” Applicant maintains the position

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that JP '639A does not teach or suggest clay that is water swelling, and argues that the clay in the reference is **not** inherently water-swelling.

In Applicant's understanding, the two main issues in the rejection are therefore: 1) whether the clay in JP '639A inherently meets the limitation of "water swelling clay mineral (B)" in claim 1; and 2) whether the composition in JP '639A has a "three dimensional network structure" as recited in claim 1. Applicant here addresses these two issues:

First, regarding the "water swelling clay mineral (B)," in support of Applicant's argument, Applicant cites the attached document "Handbook of Clay Sciences," page 965, a general reference in the art. This reference can be seen to discuss "non-swelling" and "swelling" clay minerals. That is, not all clays are inherently water-swelling.

Applicant submits that the JP'639A teaches that: "For the additive, the pulverized filler, such as talc, clay, diatomaceous earth, can be used." Regarding the additive, JP'639 teaches not only **clay** but also teaches **talc** and **diatomaceous earth**, which both are **water non-swelling materials**. JP'639 also teaches that clay, as well as talc and diatomaceous earth, is used as **pulverized filler**.

Therefore, there is no disclosure for water-swelling clay, and the clay in JP '639A is not inherently water-swelling.

Secondly, regarding the "three dimensional network structure," Applicant makes the following points:

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Claim 1 recites that "the organic polymer (A) and the water-swelling clay mineral (B) interact to form a three-dimensional network structure." In other words, the three-dimensional network structure is restricted to the network formed from interaction between the organic polymer (A) and the water-swelling clay mineral (B).

On page 8, lines 3-11, of the present specification, there is disclosure that the water swelling clay mineral (B) is capable of swelling and **forming a uniform dispersion in water**. On page 11, lines 5-9 of the present specification, there is disclosure that the three dimensional network structure can be formed solely through the action on the water swelling clay mineral, **without the use of any normal organic cross linking agents**. That is, the three dimensional network structure recited in claim 1 is not based on a crosslinker. No such structure is described in JP '639A.

Regarding the unexpected effect of the invention of the three dimensional network structure formed from interaction between the organic polymer (A) and the water-swelling clay mineral (B), there is disclosure on page 11, lines 12-16, of the present application that the result material having the above-mentioned three dimensional network structure shows better mechanical properties than that without the three dimensional network structure.

Furthermore, in Example 1 (page 20, line 20, to page 21, line 8, of this present application) there is disclosure that "sheet-like layers of clay with a thickness of **1 to several nanometers**" (emphasis added) was observed uniformly dispersed throughout the polymer composite having the three dimensional network structure, using TEM (transmission electron microscope). There is also

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disclosure about mechanical properties on the composite with the above-mentioned three dimensional network structure that the excellent mechanical properties were achieved even though no organic cross linking agent was used, in page 21, line 21, to page 22, line 13.

The three dimensional network structure of claim 1 is not disclosed by JP' 639, and, moreover, has excellent mechanical properties that would be unexpected over the reference.

Claims 1, 3, 5, 9, and 13-16 are therefore not anticipated by and are not obvious over JP 63028639 A.

Claims 1-5, 9 and 13-16 are rejected under 35 U.S.C. §102(b) as being anticipated by or, in the alternative, under 35 U.S.C. §103(a) as obvious over Lorah et al. (US 2002/0055581 A1 or US 2002/0058739 A1). (Office action page 3)

Applicant respectfully notes that claim 2 is not pending. The rejection of pending claims 1, 3-5, 9 and 13-16 is respectfully traversed. Applicant generally maintains the arguments made in the Amendment dated July 2, 2007.

As in the above rejection, the Examiner refers to page 8, lines 3-11, and page 10, lines 7-10, of the present specification, and discusses the use of optional crosslinker (C) in the present specification. Again, Applicant submits that optional crosslinker (C) is not required in claim 1, and this argument by the Examiner does not appear to be relevant.

On page 4, line 7, the Examiner notes that Lorah does not show any working examples of a water-soluble (meth)acrylate ester, apparently responding to Applicant's argument that Lorah et al.

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“does not disclose that using a water-soluble (meth)acrylate ester as a monomer is required.”

Applicant notes that this previous argument addressed only the issue of anticipation, as paragraph [0031] describes a wide variety of monomers, and this disclosure cannot be viewed as **anticipating** the present claims.

The Examiner also refers to Lorah's disclosure regarding an unmodified clay, in paragraphs [0041] and [0065]. The Examiner comments regarding increasing the d-spacing between the clay layers in paragraph [0009] of the reference, apparently implying that this means that Lorah's clay is inherently water-swelling.

In response, the Applicant argues that the clays in Lorah et al. are hydrophobically modified clays or unmodified clay, and are not water-swelling clays as required by claim 1. Moreover, Applicant again argues that the three dimensional network structure formed from interaction between the organic polymer (A) and the water-swelling clay mineral (B) is not disclosed by Lorah et al. and would not be inherent in the reference.

Claims 1-5, 9 and 13-16 are therefore not anticipated by, and are not obvious over, Lorah et al.

Claims 6-8 and 10 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitation of the base claim and any intervening claims. (Office action page 5)

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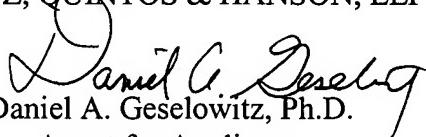
As Applicant has traversed the rejection of base claim 1, Applicant has not amended claims 6-8 and 10 to be in independent form. Reconsideration of the objection is respectfully requested.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact the Applicant's undersigned agent at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, the Applicant respectfully petitions for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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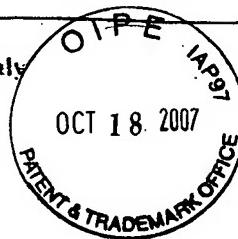


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Enclosure: F. Bergaya et al., eds., "Handbook of Clay Science. Developments in Clay Science, Vol. 1" 2006, Elsevier, Ltd., page 965.

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Chapter 12.9

SURFACE AREA AND POROSITY

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The specific surface area (SSA) of clay minerals and related materials is one of their most important properties controlling surface phenomena. The SSA of non-swelling and non-microporous phyllosilicates ranges from a fraction to more than one hundred square meters per gram. Higher values are obtained with microporous clay minerals, such as sepiolite and palygorskite, and swelling (expanding) clay minerals.

Clay minerals play an important role in natural and industrial processes as they can take up organic and inorganic molecules at solid-liquid or solid-gas interfaces. The surface properties of these minerals have to be precisely determined if we are to gain insight into the underlying mechanisms. The present chapter has two parts; the first is concerned with the determination of the SSA of clay minerals, in general, and related topics, while the second part is specific to swelling clay minerals.

12.9.1. THE SPECIFIC SURFACE AREA OF CLAY MINERALS

In the case of non-swelling clay minerals, the most widely used technique for determining SSA is based on gas adsorption, notably of nitrogen gas at 77 K. Adsorption isotherms, describing the amount of gas adsorbed as a function of relative pressure (P/P_0) can exhibit different features depending on the size of particles, the presence of organized pores (between 0.5 and 50 nm), and the energetic properties of the mineral surface (Sing et al., 1985).

Fig. 12.9.1 shows the classical shape of a gas adsorption isotherm. In the low-pressure region, from $P/P_0 = 0$ to ≈ 0.2 , adsorption occurs on the external surface of the particles and the surface of micropores, if such pores (diameter 0–2 nm) exist. At larger relative pressures ($0.4 < P/P_0 < 0.95$), adsorption of the second and third layers occurs, accompanied by condensation into mesopores (4–40 nm). Finally, at relative pressures > 0.95 , condensation into macropores (> 40 nm) takes place.